

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
8 March 2001 (08.03.2001)

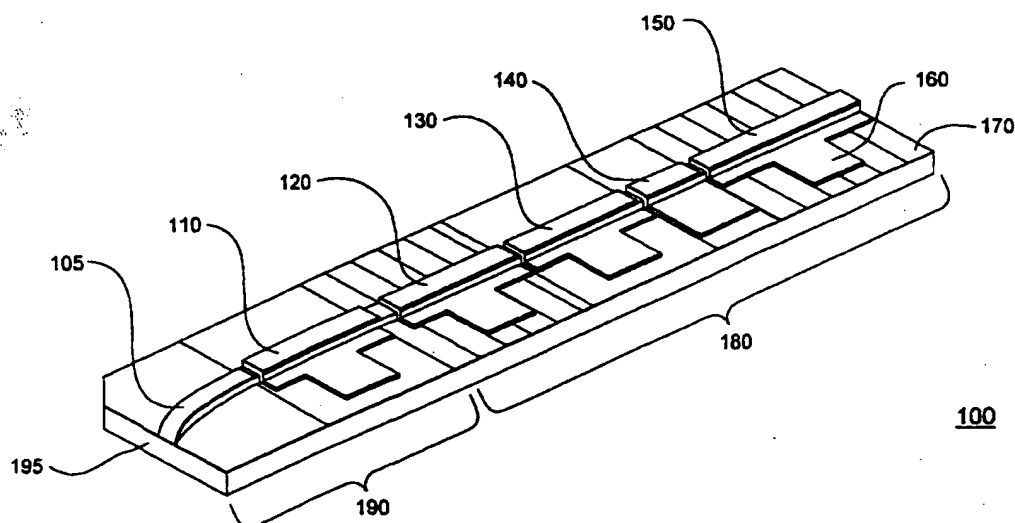
PCT

(10) International Publication Number  
WO 01/17076 A3

- (51) International Patent Classification<sup>7</sup>: H01S 5/0625, 5/026
- (21) International Application Number: PCT/US00/22816
- (22) International Filing Date: 18 August 2000 (18.08.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
- |            |                               |    |
|------------|-------------------------------|----|
| 60/152,049 | 2 September 1999 (02.09.1999) | US |
| 60/152,038 | 2 September 1999 (02.09.1999) | US |
| 60/152,072 | 2 September 1999 (02.09.1999) | US |
| 09/614,377 | 12 July 2000 (12.07.2000)     | US |
| 09/614,895 | 12 July 2000 (12.07.2000)     | US |
| 09/614,674 | 12 July 2000 (12.07.2000)     | US |
| 09/614,378 | 12 July 2000 (12.07.2000)     | US |
| 09/614,376 | 12 July 2000 (12.07.2000)     | US |
| 09/614,195 | 12 July 2000 (12.07.2000)     | US |
| 09/614,375 | 12 July 2000 (12.07.2000)     | US |
| 09/614,865 | 12 July 2000 (12.07.2000)     | US |
| 09/614,224 | 12 July 2000 (12.07.2000)     | US |
- (53) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:
- |          |                               |
|----------|-------------------------------|
| US       | 60/152,049 (CIP)              |
| Filed on | 2 September 1999 (02.09.1999) |
| US       | 60/152,038 (CIP)              |
| Filed on | 2 September 1999 (02.09.1999) |
| US       | 60/162,072 (CIP)              |
| Filed on | 2 September 1999 (02.09.1999) |
| US       | 09/614,377 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,895 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,674 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,378 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,376 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,195 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,375 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,865 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |
| US       | 09/614,224 (CIP)              |
| Filed on | 12 July 2000 (12.07.2000)     |

[Continued on next page]

(54) Title: TUNABLE LASER SOURCE WITH INTEGRATED OPTICAL AMPLIFIER



(57) Abstract: A laser assembly includes an epitaxial structure formed on a substrate. A separately controllable tunable laser resonator and external optical amplifier are formed in the epitaxial structure. At least a portion of the laser and amplifier share a common waveguide, which may have non-uniform optical or geometrical properties along the waveguide centerline or across a normal to the centerline.

BEST AVAILABLE COPY



(71) **Applicant** (*for all designated States except US*): **AGILITY COMMUNICATIONS, INC.** [US/US]; 600 Pine Street, Second Floor, Santa Barbara, CA 93117 (US).

(72) **Inventors; and**

(75) **Inventors/Applicants** (*for US only*): **MASON, Thomas, Beck** [US/US]; 829 C Sasipuedes, Santa Barbara, CA 93103 (US). **FISH, Gregory** [US/US]; 4716 Frazier Lane, Santa Barbara, CA 93110 (US). **COLDREN, Larry** [US/US]; 4665 Via Vistosa, Santa Barbara, CA 93110 (US).

(74) **Agent**: **DAVIS, Paul**; Wilson Sonsini Goodrich & Rosati, 650 Page Mill Road, Palo Alto, CA 94304-1050 (US).

(81) **Designated States** (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,

NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) **Designated States** (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

(88) **Date of publication of the international search report:**

25 October 2001

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

BEST AVAILABLE COPY

## INTERNATIONAL SEARCH REPORT

International Application No.

PC1/JS 00/22816

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H01S5/0625 H01S5/026

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 715 268 A (LANG ROBERT J ET AL) 3 February 1998 (1998-02-03) column 5, line 60 -column 7, line 10; figure 3	1,77,88, 99,131 44
X A	US 5 088 105 A (STREIFER DECEASED WILLIAM ET AL) 11 February 1992 (1992-02-11)  column 6, line 11 -column 7, line 8; figure 3  --- -/--	1,6-9, 13,18, 77,99, 131 44,88

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

16 May 2001

Date of mailing of the international search report

22/05/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo.nl.  
Fax: (+31-70) 340-3016

Authorized officer

Hervé, D

## INTERNATIONAL SEARCH REPORT

International Application No

PC1/JS 00/22816

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LEE S -L ET AL: "SAMPLED GRATING DBR LASER ARRAYS WITH ADJUSTABLE 0.8/1.6-NM WAVELENGTH SPACING" IEEE PHOTONICS TECHNOLOGY LETTERS, IEEE INC. NEW YORK, US, vol. 11, no. 8, August 1999 (1999-08), pages 955-957, XP000860962 ISSN: 1041-1135 the whole document ---	1, 44, 77, 88, 99, 131
A	VIJAYSEKHAR JAYARAMAN ET AL: "THEORY, DESIGN, AND PERFORMANCE OF EXTENDED TUNING RANGE SEMICONDUCTOR LASERS WITH SAMPLED GRATINGS" IEEE JOURNAL OF QUANTUM ELECTRONICS, IEEE INC. NEW YORK, US, vol. 29, no. 6, 1 June 1993 (1993-06-01), pages 1824-1834, XP000397620 ISSN: 0018-9197 the whole document ---	1, 44, 77, 88, 99, 131
A	GB 1 539 028 A (TOKYO INST OF TECH) 24 January 1979 (1979-01-24) figures 8-11 ---	44
A	EP 0 620 475 A (CANON KK) 19 October 1994 (1994-10-19) figure 16 -----	44

BEST AVAILABLE COPY

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC1/US 00/22816

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5715268 A	03-02-1998	NONE	
US 5088105 A	11-02-1992	NONE	
GB 1539028 A	24-01-1979	NONE	
EP 0620475 A	19-10-1994	JP 6265958 A	22-09-1994
		JP 7045860 A	14-02-1995
		JP 7146456 A	06-06-1995
		JP 3104831 B	30-10-2000
		JP 7202343 A	04-08-1995
		DE 69415576 D	11-02-1999
		DE 69415576 T	17-06-1999
		US 5613020 A	18-03-1997

**THIS PAGE BLANK (USPTO)**